Remarks

In view of the above amendments to the claims and the following discussion, the applicants submit that none of the claims now pending in the application are obvious under the provisions of 35 U. S. C. § 103. Thus, the applicants believe that all of these claims are in allowable form.

REJECTIONS

A. 35 U. S. C. § 103

1. Claims 1-3 and 7 are patentable over Howard in view of Takahashi et al.

Claims 1-3 and 7 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Howard (US Patent Publication 2003/0052614 published March 20, 2003) in view of Takahashi et al. (US Patent 6,677,937 issued January 13, 2004). The applicants submit that these claims are not rendered obvious by the combination of these references.

Claim 1 is directed to an image display screen suitable for displaying image frames, including light emitters distributed as rows of emitters and columns of emitters to form an array of emitters. The emitters of the array being able to be supplied with a current during a screen display mode. An emitter addressing circuit is associated with each emitter of the array. The emitter addressing circuit having a current modulator able to supply current to the emitter, during the display mode, the modulator comprising a gate electrode and two current flow electrodes, a charge capacitance able to store, at each image frame, an addressing voltage representative of an image datum during the display mode, the voltage being applied to the gate electrode of the current modulator, a control system able to apply a bias voltage to the gate electrode of the current modulator, during a screen standby mode, the bias voltage having a

bias inverse to the bias of the addressing voltage applied to the charge capacitance during the screen display mode. The control system including addressing control means able to apply on the one hand said addressing voltage to the gate electrode of the current modulator during the screen display mode and, on the other hand, said bias voltage during the screen standby mode, the duration of application of the bias voltage having a bias inverse to the bias of the addressing voltage is greater than the duration of an image frame, and wherein the value of said bias voltage lies between -8 volts and -25 volts.

Howard describes an image display screen comprising emitters, an emitter addressing circuit, current modulators, charge capacitances and a control system, as described in amended claim 1. Howard describes further that the control system is able to apply a data voltage to the gate electrode of the modulators in a first phase during a screen display mode; and during a second phase during the screen display mode, a reverse bias voltage is applied to the gate electrode. The gate electrode is alternatingly supplied with the data voltage and the reverse data voltage within a pixel refresh period T, which consists of an even number data frame and an odd number reverse bias frame (*see*, Howard at FIGS. 2a-2b and paragraphs 0020 – 0023).

The reverse bias voltage is in particular <u>a voltage opposite to the data voltage</u> (*see*, Howard at paragraph 0020). The reverse data level is in particular selected by reference to the data voltage level <u>for each pixel.</u> Accordingly, a high level data signal results in a high level reverse data signal (*see*, Howard at paragraph 0024), to reduce effects of a threshold drift of the modulator gate. Howard does not disclose to use an inverse bias voltage during a screen stand-by mode, during which stand-by mode the display screen is not operating, and which stand-by mode has a duration greater than the duration of an image frame, as described in amended claim 1 and new claims 8 and 14.

Takahashi et al. describes an image display screen having liquid crystal display elements, which are controlled by two terminal elements (*see*, Takahashi et al. at FIGS. 6-7). The two terminal elements have the problem in which a

sticking phenomenon occurs due to variations in the voltage current characteristics of the two terminal elements. To solve this problem, a drive voltage is switched to a plurality of levels and applied to the scanning electrodes (*see*, Takahashi et al. at column 2, lines 40 – 51).

However, upon turning the power switch off, all the signal supplies including the selection voltage and the display data signal are stopped at once due to the termination of the driver output control signal. Therefore, with respect to the pixels that have been lit up immediately before turning the power switch off, the electric charge corresponding to the lit-up display is left accumulated for a while even after turning the power switch off due to the charge maintaining effect of the two-terminal elements, with the result that the display pattern applied immediately before turning the power switch off remains, causing a problem of remaining images (*see*, Takahashi et al. at column 3, lines 31 – 48). Also in the case when the driver voltage is switched to several data voltage levels, a dc voltage is applied upon turning the power switch off, while a selection voltage is applied to the scanning electrodes, with the result that pixels of the scanning electrodes are lit up, causing also a residual display image. Since in this case a residual dc voltage is supplied to the liquid crystal display elements for a long time, the liquid crystals are adversely affected (*see*, Takahashi et al. at column 4, lines 1-10).

To solve these problems, Takahashi et al. teaches that the display elements are maintained in the non-lit-up display states over the entire surface up to the completion of a period corresponding to a predetermined number of frames, after the frame in which the power signal switch-off has been detected. In this manner, the control period including the response time having changes in display states is completed in synchronized timing with the switching of frames, thus <u>it becomes possible to easily control the non-lit-up display over the entire surface</u> (*see*, Takahashi et al. at column 6, line 63 to column 7, line 13). As described for example with regard to Figure 1, a driver output control signal DSPOF remains on after switching-off of the display apparatus, and an

"OUTPUT OF NON-LIT-UP DISPLAY DATA" signal is applied to the image screen. Takahashi et al. therefore uses only an extended on-time of several frames, during which the display elements are maintained in the non-lit-up display states over the entire surface. No screen standby mode is disclosed or suggested which is for example 1 or 2 hours, during which an inverse bias voltage is applied.

The on-time of the display apparatus is therefore maintained only for a short time period of several frames, to complete the control period in synchronize timing with a switching of frames to provide a controlled switching-off of the image display. No screen stand-by mode is provided, as described in independent claims 1, 8 and 14, which can have e.g. a duration between 1 and 2 hours, during which a bias voltage is applied. Takahashi et al. in particular does not teach to use a highly negative bias voltage between a range of -8 volts and -25 volts, as described in amended claim 1.

The problem of the residual display images is in particular completely different with regard to the drifting problem of the triggering thresholds of the present invention. Therefore, only a short time period of several frames is sufficient, to provide a controlled switching-off of the image display. The problem of the residual display images correspondingly does not give a motivation for a person skilled in the art, to apply a screen standby mode for solving the problem of the triggering thresholds.

The sticking problem of the two terminal elements is solved in Takahashi et al. by applying a drive voltage which is switched to a plurality of different levels and applied to the scanning electrodes (*see*, Takahashi et al. at column 2, lines 40 – 51). This leads a person skilled in the art into a direction, which is completely different with regard to the solutions as described in the new independent claims.

Thus, claim 1 as amended is new and inventive over the cited prior art and should be patentable. Claims 8 and 14 recite similar subject matter, as claim 1.

For the reasons stated above claims 2-3 and 7 are also patentable over Howard in view of Takahashi et al.

2. Claims 4-6 are patentable over Howard in view of Takahashi et al. and further in view of Hotto.

Claims 4-6 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Howard (US Patent Publication 2003/0052614 published March 20, 2003) in view of Takahashi et al. (US Patent 6,677,937 issued January 13, 2004) and further in view of Hotto (U. S. Patent 5,444,457 issued August 22, 1995) . The applicants submit that these claims are not rendered obvious by the combination of these references.

Claims 4-6 depend from claim 1. Claim 1 is directed to an image display screen suitable for displaying image frames, including light emitters distributed as rows of emitters and columns of emitters to form an array of emitters. The emitters of the array being able to be supplied with a current during a screen display mode. An emitter addressing circuit is associated with each emitter of the array. The emitter addressing circuit having a current modulator able to supply current to the emitter, during the display mode, the modulator comprising a gate electrode and two current flow electrodes, a charge capacitance able to store, at each image frame, an addressing voltage representative of an image datum during the display mode, the voltage being applied to the gate electrode of the current modulator, a control system able to apply a bias voltage to the gate electrode of the current modulator, during a screen standby mode, the bias voltage having a bias inverse to the bias of the addressing voltage applied to the charge capacitance during the screen display mode. The control system including addressing control means able to apply on the one hand said addressing voltage to the gate electrode of the current modulator during the screen display mode and, on the other hand, said bias voltage during the screen standby mode, the duration of application of the bias voltage having a bias

inverse to the bias of the addressing voltage is greater than the duration of an image frame, and wherein the value of said bias voltage lies between -8 volts and -25 volts.

Howard describes an image display screen comprising emitters, an emitter addressing circuit, current modulators, charge capacitances and a control system, as described in amended claim 1. Howard describes further that the control system is able to apply a data voltage to the gate electrode of the modulators in a first phase during a screen display mode; and during a second phase during the screen display mode, a reverse bias voltage is applied to the gate electrode. The gate electrode is alternatingly supplied with the data voltage and the reverse data voltage within a pixel refresh period T, which consists of an even number data frame and an odd number reverse bias frame (*see*, Howard at FIGS. 2a-2b and paragraphs 0020 – 0023).

The reverse bias voltage is in particular <u>a voltage opposite to the data voltage</u> (*see*, Howard at paragraph 0020). The reverse data level is in particular selected by reference to the data voltage level <u>for each pixel.</u> Accordingly, a high level data signal results in a high level reverse data signal (*see*, Howard at paragraph 0024), to reduce effects of a threshold drift of the modulator gate. Howard does not disclose to use an inverse bias voltage during a screen stand-by mode, during which stand-by mode the display screen is not operating, and which stand-by mode has a duration greater than the duration of an image frame, as described in amended claim 1 and new claims 8 and 14.

Takahashi et al. describes an image display screen having liquid crystal display elements, which are controlled by two terminal elements (*see*, Takahashi et al. at FIGS. 6-7). The two terminal elements have the problem in which a sticking phenomenon occurs due to variations in the voltage current characteristics of the two terminal elements. To solve this problem, a drive voltage is switched to a plurality of levels and applied to the scanning electrodes (*see*, Takahashi et al. at column 2, lines 40 – 51).

However, upon turning the power switch off, all the signal supplies including the selection voltage and the display data signal are stopped at once due to the termination of the driver output control signal. Therefore, with respect to the pixels that have been lit up immediately before turning the power switch off, the electric charge corresponding to the lit-up display is left accumulated for a while even after turning the power switch off due to the charge maintaining effect of the two-terminal elements, with the result that the display pattern applied immediately before turning the power switch off remains, causing a problem of remaining images (*see*, Takahashi et al. at column 3, lines 31 – 48). Also in the case when the driver voltage is switched to several data voltage levels, a dc voltage is applied upon turning the power switch off, while a selection voltage is applied to the scanning electrodes, with the result that pixels of the scanning electrodes are lit up, causing also a residual display image. Since in this case a residual dc voltage is supplied to the liquid crystal display elements for a long time, the liquid crystals are adversely affected (*see*, Takahashi et al. at column 4, lines 1-10).

To solve these problems, Takahashi et al. teaches that the display elements are maintained in the non-lit-up display states over the entire surface up to the completion of a period corresponding to a predetermined number of frames, after the frame in which the power signal switch-off has been detected. In this manner, the control period including the response time having changes in display states is completed in synchronized timing with the switching of frames, thus it becomes possible to easily control the non-lit-up display over the entire surface (*see*, Takahashi et al. at column 6, line 63 to column 7, line 13). As described for example with regard to Figure 1, a driver output control signal DSPOF remains on after switching-off of the display apparatus, and an "OUTPUT OF NON-LIT-UP DISPLAY DATA" signal is applied to the image screen. Takahashi et al. therefore uses only an extended on-time of several frames, during which the display elements are maintained in the non-lit-up display states over the entire surface. No screen standby mode is disclosed or

suggested which is for example 1 or 2 hours, during which an inverse bias voltage is applied.

The on-time of the display apparatus is therefore maintained only for a short time period of several frames, to complete the control period in synchronize timing with a switching of frames to provide a controlled switching-off of the image display. No screen stand-by mode is provided, as described in independent claims 1, 8 and 14, which can have e.g. a duration between 1 and 2 hours, during which a bias voltage is applied. Takahashi et al. in particular does not teach to use a highly negative bias voltage between a range of -8 volts and -25 volts, as described in amended claim 1.

The problem of the residual display images is in particular completely different with regard to the drifting problem of the triggering thresholds of the present invention. Therefore, only a short time period of several frames is sufficient, to provide a controlled switching-off of the image display. The problem of the residual display images correspondingly does not give a motivation for a person skilled in the art, to apply a screen standby mode for solving the problem of the triggering thresholds.

The sticking problem of the two terminal elements is solved in Takahashi et al. by applying a drive voltage which is switched to a plurality of different levels and applied to the scanning electrodes (*see*, Takahashi et al. at column 2, lines 40 – 51). This leads a person skilled in the art into a direction, which is completely different with regard to the solutions as described in the new independent claims.

Hotto describes an image display apparatus comprising an improved display driver for matrix addressable displays, which uses real-time computation and memory circuits to simulate the electro-optic condition and the accumulated DC bias of individual display elements. Hotto in particular does not disclose or give any hints into the direction to apply a bias voltage within a screen stand-by mode, which has a highly negative voltage in a range of -8 volts and -25 volts.

Also the other references do not disclose or give any hints into the direction to apply a bias voltage within a screen stand-by mode, which has a highly negative voltage in a range of -8 volts and -25 volts, or which is below -8 volts. Thus, amended claim 1 is new and inventive over the cited references. Also, none of the references disclose or give any hints into the direction to include means arranged between each emitter and a power generator for cutting the supply to the emitters during a screen standby mode.

Claims 4-6 depend directly, or indirectly, from claim 1. In view of the above arguments, Applicants respectfully submit that claims 4-6 are also patentable over Howard in view of Takahashi et al. and further in view of Hotto.

CONCLUSION

Thus, the applicants submit that none of the claims, presently in the application, are obvious under the provisions of 35 U. S. C. § 103. Consequently, the applicants believe that all of the claims are presently in condition for allowance. Accordingly, both reconsideration of this application and its swift passage to issue are earnestly solicited.

If, however, the Examiner believes that there are any unresolved issues requiring adverse final action in any of the claims now pending in the application,

it is requested that the Examiner telephone Ms. Patricia A. Verlangieri, at (609) 734-6867, so that appropriate arrangements can be made for resolving such issues as expeditiously as possible.

Respectfully submitted,

Patricia A. Verlangieri

Patricia A. Verlangieri, Attorney
Reg. No. 42,201
(609) 734-6867

Patent Operations
Thomson Licensing LLC
P. O. Box 5312
Princeton, New Jersey 08543-5312

February 3, 2011